/*COMPUTATIONAL FLUID DYNAMICS FOR AEROSPACE APPLICATIONS*/

ASSIGNMENT - I

/*CODE TO EXECUTE AREA - MACH NUMBER RELATION BY USING C LANGUAGE*/

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C-PROGRAM:

/* AREA MACH NUMBER RELATION */

```c
#include<stdio.h>

#include<math.h>

int main()

{

int i;

float M,G,A,B,C,D,E;

for(i=1;i<=6;i++)

{

printf("Enter the value of Mach number and specific heat ratio ");

scanf("%f%f",&M,&G);

A=1+(G-1)*M*M/2;

B=(2/(G+1))*A;

C=(G+1)/(2*(G-1));

D=pow(B,C);

E=D/M;

printf("The Area ratio A/A*=%f\n",E);

}

return 0;

}
```
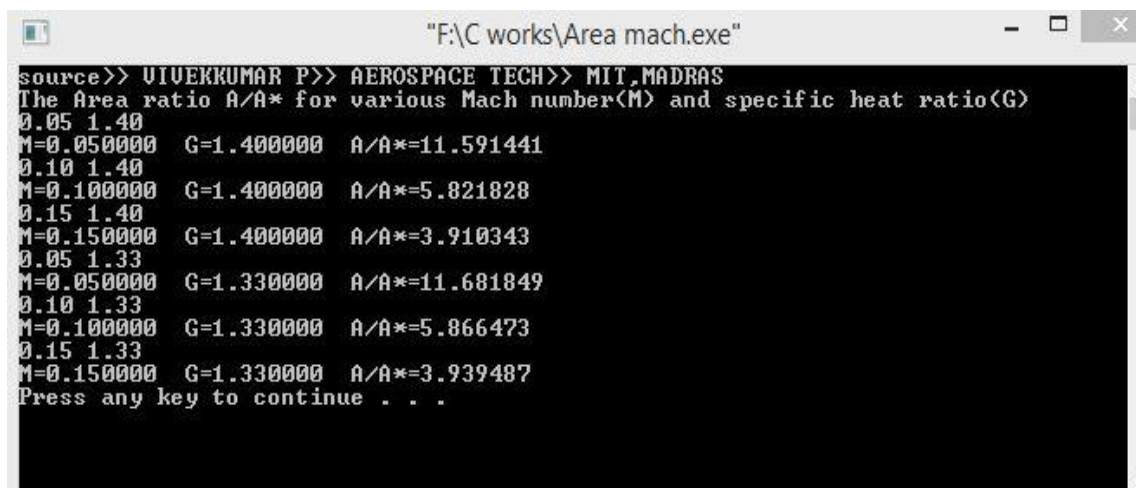
OUTPUT:

```c
        /* PROGRAM TO FIND SUBSONIC & SUPER SONIC MACH NUMBER AT A
                      PARTICULAR AREA RATIO*/

#include<stdio.h>

#include<conio.h>

#include<math.h>


int main()

{

    int i,j;

    printf("         *   AREA - MACH NUMBER RELATION  *\n\n");

    printf("Decide the flow condition \n\n");

    for(j=1;j<=6;j++)

    {

    printf("1.To find Area ratio at subsonic   region\n");

    printf("2.To find Area ratio at supersonic region\n");

    scanf("%d\n\n",&i);

    float G,AR,T,E,R,A,B,C,D,F,X,V,M1,Z,M2;

    scanf("%f%f",&G,&AR);

    printf("The specific heat ratio = %f, The Area ratio = %f\n",G,AR);

    switch(i)

    {

    case 1:

    {

    T=AR*AR;

    E=(G+1)/(G-1);

    R=2/(G+1);

    A=pow(R,E);

    B=(1-T-2*A)/A;
```

```c
C=B*B-4;

X=(-B-sqrt(C))/2;

M1=sqrt(X);

printf("The subsonic Mach number M1 = %f\n\n",M1);

break;

}

case 2:

{

T=AR*AR;

E=(G+1)/(G-1);

D=1/(E-1);

Z=pow(T,D);

V=(G-1)/(G+1);

R=(G+1)/2;

A=pow(V,R);

B=(1-Z-2*A)/A;

C=B*B-4;

X=(-B+sqrt(C))/2;

M2=sqrt(X);

printf("The super sonic Mach number M2 = %f\n\n",M2);

break;

}

}

}

}
```
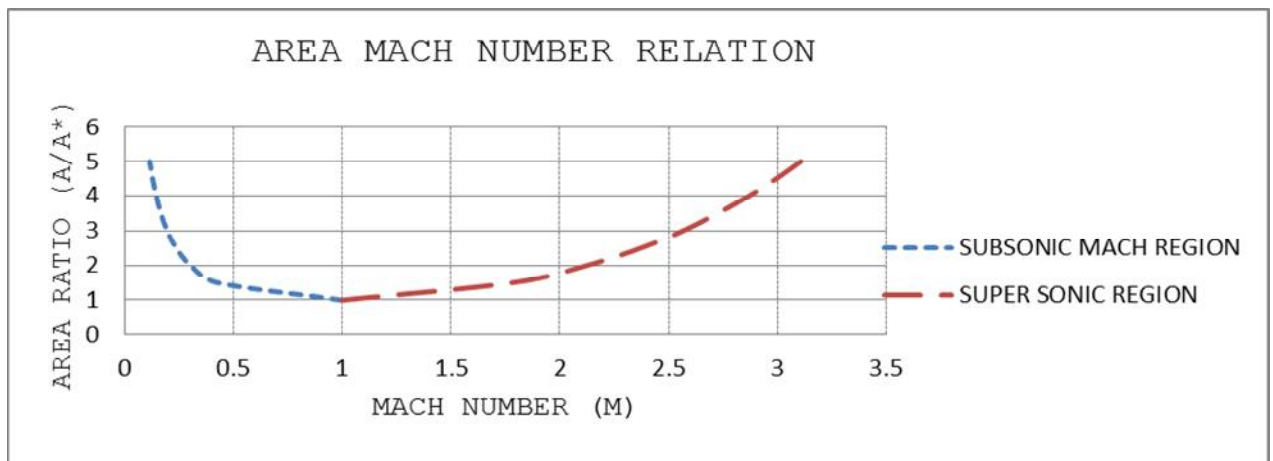
Table 1: Data generated by using the above C-program

Area ratio	SUB SONIC MACH NUMBER	SUPER SONIC MACH NUMBER
1	1	1
1.5	0.424385	1.788632
2	0.303366	2.126523
2.5	0.238232	2.371308
3	0.196688	2.566362
3.5	0.167685	2.726967
4	0.146225	2.870822
4.5	0.129682	2.995437
5	0.116523	3.107255

OUTPUT:


```
"C:\Users\VIVEK\Documents\C-Free\Temp\Untitled1.exe"

SOURCE>> VIVEKKUMAR P>> AEROSPACE TECH>> MIT,MADRAS

          *   AREA - MACH NUMBER RELATION   *

Decide the flow condition

1.To find Area ratio at subsonic   region
2.To find Area ratio at supersonic region
1
1.4 4.0
The specific heat ratio = 1.400000, The Area ratio = 4.000000
The subsonic Mach number M1 = 0.146225

1.To find Area ratio at subsonic   region
2.To find Area ratio at supersonic region
2
1.4 4.0
The specific heat ratio = 1.400000, The Area ratio = 4.000000
The super sonic Mach number M2 = 2.870822

1.To find Area ratio at subsonic   region
2.To find Area ratio at supersonic region
1
1.4 4.5
The specific heat ratio = 1.400000, The Area ratio = 4.500000
The subsonic Mach number M1 = 0.129682

1.To find Area ratio at subsonic   region
2.To find Area ratio at supersonic region
2
1.4 4.5
The specific heat ratio = 1.400000, The Area ratio = 4.500000
The super sonic Mach number M2 = 2.995437

1.To find Area ratio at subsonic   region
2.To find Area ratio at supersonic region
1
1.4 5.0
The specific heat ratio = 1.400000, The Area ratio = 5.000000
The subsonic Mach number M1 = 0.116523

1.To find Area ratio at subsonic   region
2.To find Area ratio at supersonic region
2
1.4 5.0
The specific heat ratio = 1.400000, The Area ratio = 5.000000
The super sonic Mach number M2 = 3.107255

Press any key to continue . . .
```